Electromagnetics
Centre for Engineering Studies

DPP-1 (Vectors)

Q-1. A potential function is given below

$$V = \left(\sin\frac{\pi}{2}x\right)\left(\sin\frac{\pi}{3}y\right)e^{-z}$$

The rate of increase of V at point P(1,2,3) in the direction of origin

Q-2. Over the closed surface of a sphere of radius r $\oint \vec{ds} = ?$

(a) $4\pi r^2$ (b) $\frac{4}{3}\pi r^3$ (c) 0 (d) $\pi r^2$

Q-3. A vector field $\vec{E} = yz\hat{i} + xz\hat{j} + xy\hat{k}$. The field is

(a) Solenoidal (b) Time homonic (c) Irrotational (d) both solenoi and irrotation

Q-4. Given a vector field $\vec{F} = \hat{i} + 2\hat{j} + 3\hat{k}$. find $\int_S \vec{F}\cdot\vec{ds}$ over the squre pla surface whose corners are at (0,0,1), (1,0,1), (1,1,0), (0,1,0)

Q-5. for a vector function $\vec{F} = \frac{K_1}{r}\hat{r} + K_2 z\hat{z}$ which of the following statement is true

1. $\oint \vec{F}\cdot\vec{ds} = 12\pi(K_1 + 2K_2)$ over the surface of a closed cylinder about the z-axis specified by $z = \pm 3$ and $r = 2$

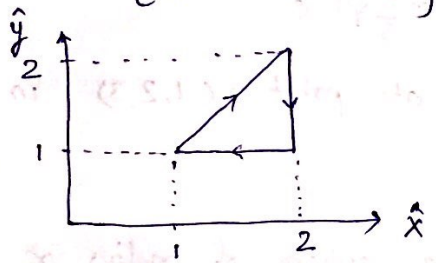
2. $\int_{vol.} \nabla\cdot\vec{F}\, dv = 12\pi(K_1 + 2K_2)$ over the volume of a cylinder specified by $z = \pm 3$ and $r = 2$. cylinder is about z-axis

(a) statement 1 is true (b) statement 2 is true

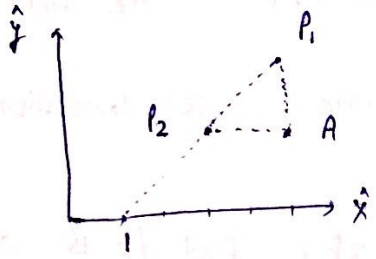
(c) both statements are true (d) No statement is true

Q-6. Assume a vector function $\vec{A} = 3x^2y^3\hat{i} - x^3y^2\hat{j}$ can A be expressed as the gradient of a scalor

Q-7 for the above question find $\oint \vec{A}\cdot d\vec{l}$ around a contour shown below




Q-8. Given a vector function $\vec{F} = xy\hat{i} + (3x - y^2)\hat{j}$. Evaluate the integral $\int \vec{F}\cdot d\vec{l}$ from Point $P_1(5,6)$ to $P_2(3,3)$ shown in fig.




$\int \vec{F}\cdot d\vec{l}$ = ____ along the direct path $P_1P_2$

$\int \vec{F}\cdot d\vec{l}$ = ____ along the path $P_1AP_2$

Q-9. for the above question can you comment on the conservative nature of vector field $\vec{F}$

Q-10. A vector field $\vec{F}$ is expressed in spherical co-ordinate system as shown below

$$\vec{F} = \frac{25}{r^2}\hat{r}$$

find the angle that $\vec{F}$ makes with vector $\vec{A} = 2\hat{i} - \hat{j} + 2\hat{k}$ at point $P(-3,4,5)$ ____ degree

Q-11. $\oint_s (3\sin\theta\,\hat{r})\cdot d\vec{s}$ = ____

over the surface of a sphere of a radius 5 centred at origin.